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## EUROPEAN PATENT APPLICATION

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(30) Priority: 26.09.1997 SE 9703476

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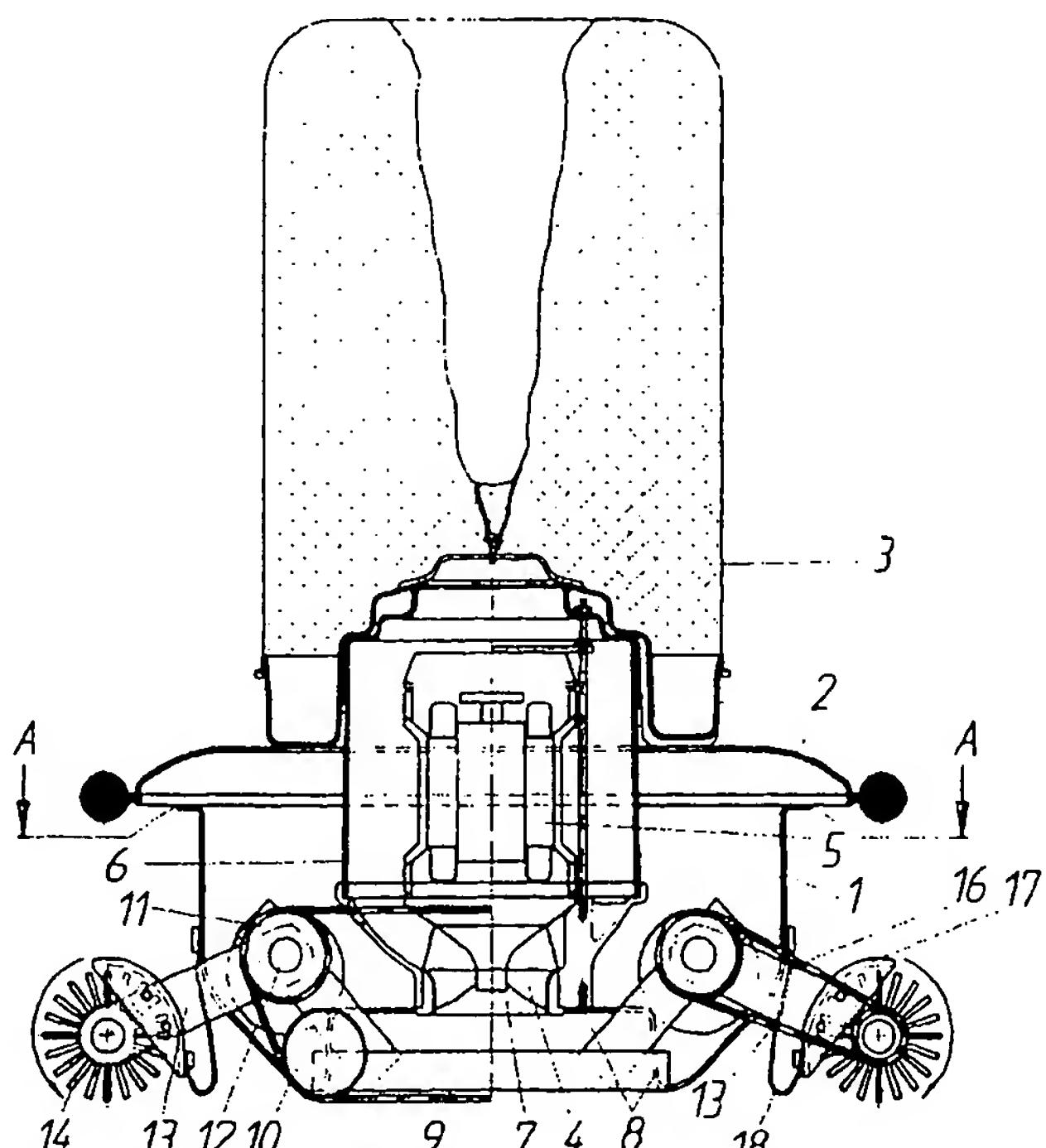
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### (54) Automatic pool-cleaner

(57) The present invention refers to a procedure, and a device for its implementation, for cleaning the bottom and sides of a water-filled pool by means of an automatic pool cleaner equipped with motor-driven track belts (9) and with a poolside programming module to control the cleaning process, the pool cleaner being equipped with two counter-rotating brush rollers (14), each provided with a longitudinal shield (17) which partly

encloses the brush roller and is sealed against the pool cleaner chassis (1) to increase the water velocity generated by the pool cleaner pump impeller (4), thereby increasing the suction established between the pool cleaner suction box (8) and the pool bottom or side walls, as applicable, to achieve more efficient cleaning and to assure the travel of the pool cleaner, particularly along the side walls of the pool.



FIGUR 1

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## Description

**[0001]** The present invention refers to a procedure, and a device for its implementation, for cleaning the bottoms and sides of water-filled pools by means of an automatic pool cleaner designed to traverse the bottom and sides of the pool in a predetermined pattern, using counter-rotating brushes to clean the surfaces, and a pump and filter unit to clean the water of dirt removed during this process and return the clean water to the pool.

**[0002]** Although earlier known devices, such as WO 94/23159, employ counter-rotating brushes, they can be used only to clean the sides of a pool at water level. Consequently, the pool must be drained successively to clean the complete side. Furthermore, means of filtering the dirty water are not available. Another known device, DE 1920172, can be used only to clean the bottom of a pool. Although this device is, admittedly, equipped with a pump and filter for cleaning the dirty water, it is equipped with no cleaning brushes whatever. A third known device, US 2988762, is also intended only for cleaning the bottom of a pool. This device is equipped with a pump and filter, as well as fixed brushes which act on the already suction-cleaned surface and is, furthermore, provided at each end with adjustable 'bumpers' which, on contact with the side of the pool, turns the device to the extent that it describes a zigzag pattern over the bottom of the pool when returning in the opposite direction.

**[0003]** The purpose of the present invention is to eliminate the weaknesses of earlier known devices by developing, as described in the appended patent claims, a procedure, and a device for its implementation, for automatically cleaning both the bottoms and sides of water-filled pools. This is achieved by providing the cleaner chassis with right-hand and left-hand track belts, each driven by an individual reversible motor, and by arranging rotating brushes, each driven by an individual motor, at right-angles to the track belts at each short end of the chassis, the directions of rotation of the brushes being such that dirt is brushed inward towards the suction box, which is located at the centre of the chassis and is equipped with an electrically driven pump to return the dirty water to the pool through a filter. To ensure that the suction exerted by the pump on the pool bottom is also sufficient to enable the cleaner to traverse the vertical sides of the pool, and to increase the pressure exerted by the brushes on the surface the brushes are provided with a longitudinal shield which is sealed against the chassis by means of a skirt made of a flexible material. The automatic forward travel arrangement of the cleaner is such that the two track belts are driven at the same speed by their respective motors until one of the rotating brushes encounters a wall or some other obstacle in the pool. This increases the current in the particular brush drive motor which, following a certain delay, stops the track belt motors. The motors then restart in the reverse

direction, with a variable delay between the left and right-hand motors, to ensure that travel towards the opposite wall takes place in the desired pattern. The pattern can be varied with the aid of the control unit, for example to select a zigzag movement or a parallel movement overlapping somewhat with the previous traversal. Alternatively, the automatic forward travel can be adjusted so that the cleaner travels forward for a specified, variable time, at the end of which the track belts are stopped and restarted in the reverse direction with a variable delay between the left and right-hand motors, so that the return travel to the next time-specific stop takes place in the desired pattern.

The invention is described in detail below with the aid of the appended drawings, of which Fig. 1 is a vertical cross-section of the pool cleaner and

Fig. 2 is a horizontal cross-section of the pool cleaner through section A-A in Fig. 1.

Fig. 1 shows the pool cleaner chassis 1, the cover 2 of which is equipped with the filter bag 3. The pump impeller 4 and its drive motor 5 are housed in a cylindrical casing, the inlet opening 7 of which is connected to a suction box 8, the lower edges of which are located immediately above the bottom of the pool (not shown). The cleaner is driven by track belts 9 of the toothed type tensioned around the idlers 10 and drive pulleys 11, the latter being attached to the output shafts 12 of the respective drive motors. The figure also shows the brush rollers 14, which are mounted on the swinging arms 13 and driven by belt from the respective drive motors. To increase the water velocity and, as a result, the suction capacity at the brushes, the latter are provided with a longitudinal shield 17 extending about one-quarter way around the brush and attached to the swinging arms 13. The shield is sealed against the pool cleaner chassis by means of a skirt 18 made of an elastic material and extending along the shield.

Fig. 2 is a horizontal cross-section of the unit through section A-A in Fig. 1. The drive motor 19 of each respective track belt 9 is housed in a water-tight casing 20. Similarly, the drive motor 21 of each respective brush roller 14 is housed in a water-tight casing 22. The opening of the suction box 8 at the bottom of the pool is indicated by the dashed line 24. A water-tight automatic control unit 23 is mounted on the chassis. The control unit is connected by wiring housed in a floating hose, which also houses the motor supply cables, to a programming module (not shown) at the side of the pool. The module enables the operator to select the desired program for the pool cleaner, which then executes the program without further commands from the operator.

## Claims

1. Procedure for cleaning the bottom and sides of a water-filled pool by means of an automatic pool cleaner equipped with motor-driven track belts and

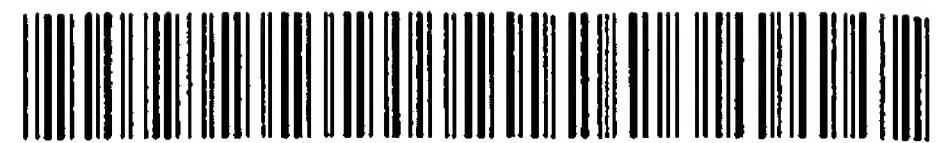


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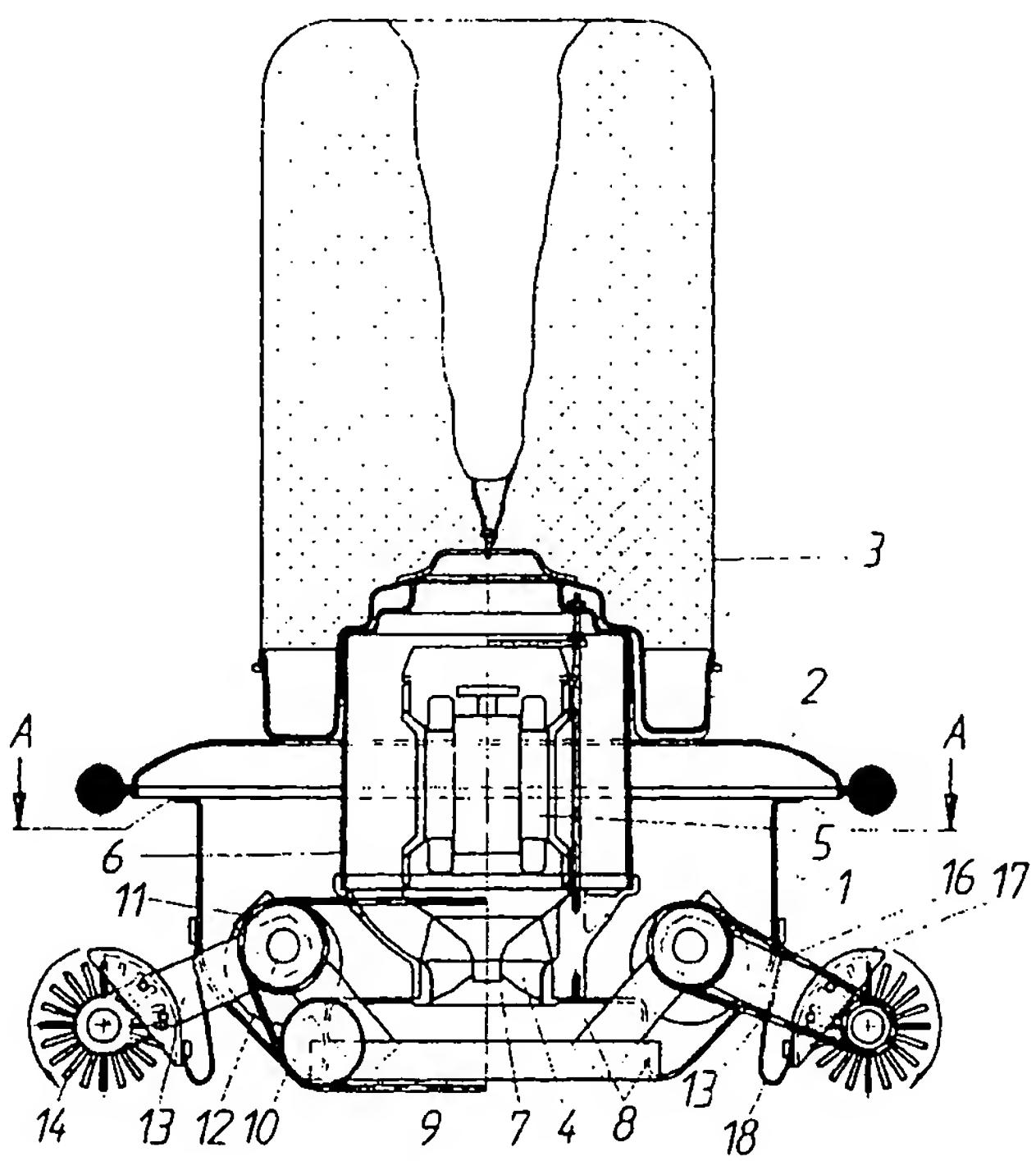
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encloses the brush roller and is sealed against the pool cleaner chassis (1) to increase the water velocity generated by the pool cleaner pump impeller (4), thereby increasing the suction established between the pool cleaner suction box (8) and the pool bottom or side walls, as applicable, to achieve more efficient cleaning and to assure the travel of the pool cleaner, particularly along the side walls of the pool.



## **FIGUR 1**

**Description**

**[0001]** The present invention refers to a procedure, and a device for its implementation, for cleaning the bottoms and sides of water-filled pools by means of an automatic pool cleaner designed to traverse the bottom and sides of the pool in a predetermined pattern, using counter-rotating brushes to clean the surfaces, and a pump and filter unit to clean the water of dirt removed during this process and return the clean water to the pool.

**[0002]** Although earlier known devices, such as WO 94/23159, employ counter-rotating brushes, they can be used only to clean the sides of a pool at water level. Consequently, the pool must be drained successively to clean the complete side. Furthermore, means of filtering the dirty water are not available. Another known device, DE 1920172, can be used only to clean the bottom of a pool. Although this device is, admittedly, equipped with a pump and filter for cleaning the dirty water, it is equipped with no cleaning brushes whatever. A third known device, US 2988762, is also intended only for cleaning the bottom of a pool. This device is equipped with a pump and filter, as well as fixed brushes which act on the already suction-cleaned surface and is, furthermore, provided at each end with adjustable 'bumpers' which, on contact with the side of the pool, turns the device to the extent that it describes a zigzag pattern over the bottom of the pool when returning in the opposite direction.

**[0003]** The purpose of the present invention is to eliminate the weaknesses of earlier known devices by developing, as described in the appended patent claims, a procedure, and a device for its implementation, for automatically cleaning both the bottoms and sides of water-filled pools. This is achieved by providing the cleaner chassis with right-hand and left-hand track belts, each driven by an individual reversible motor, and by arranging rotating brushes, each driven by an individual motor, at right-angles to the track belts at each short end of the chassis, the directions of rotation of the brushes being such that dirt is brushed inward towards the suction box, which is located at the centre of the chassis and is equipped with an electrically driven pump to return the dirty water to the pool through a filter. To ensure that the suction exerted by the pump on the pool bottom is also sufficient to enable the cleaner to traverse the vertical sides of the pool, and to increase the pressure exerted by the brushes on the surface the brushes are provided with a longitudinal shield which is sealed against the chassis by means of a skirt made of a flexible material. The automatic forward travel arrangement of the cleaner is such that the two track belts are driven at the same speed by their respective motors until one of the rotating brushes encounters a wall or some other obstacle in the pool. This increases the current in the particular brush drive motor which, following a certain delay, stops the track belt motors. The motors then restart in the reverse

direction, with a variable delay between the left and right-hand motors, to ensure that travel towards the opposite wall takes place in the desired pattern. The pattern can be varied with the aid of the control unit, for example to select a zigzag movement or a parallel movement overlapping somewhat with the previous traversal. Alternatively, the automatic forward travel can be adjusted so that the cleaner travels forward for a specified, variable time, at the end of which the track belts are stopped and restarted in the reverse direction with a variable delay between the left and right-hand motors, so that the return travel to the next time-specific stop takes place in the desired pattern.

The invention is described in detail below with the aid of the appended drawings, of which Fig. 1 is a vertical cross-section of the pool cleaner and

Fig. 2 is a horizontal cross-section of the pool cleaner through section A-A in Fig. 1.

Fig. 1 shows the pool cleaner chassis 1, the cover 2 of which is equipped with the filter bag 3. The pump impeller 4 and its drive motor 5 are housed in a cylindrical casing, the inlet opening 7 of which is connected to a suction box 8, the lower edges of which are located immediately above the bottom of the pool (not shown). The cleaner is driven by track belts 9 of the toothed type tensioned around the idlers 10 and drive pulleys 11, the latter being attached to the output shafts 12 of the respective drive motors. The figure also shows the brush rollers 14, which are mounted on the swinging arms 13 and driven by belt from the respective drive motors. To increase the water velocity and, as a result, the suction capacity at the brushes, the latter are provided with a longitudinal shield 17 extending about one-quarter way around the brush and attached to the swinging arms 13.

The shield is sealed against the pool cleaner chassis by means of a skirt 18 made of an elastic material and extending along the shield.

Fig. 2 is a horizontal cross-section of the unit through section A-A in Fig. 1. The drive motor 19 of each respective track belt 9 is housed in a water-tight casing 20. Similarly, the drive motor 21 of each respective brush roller 14 is housed in a water-tight casing 22. The opening of the suction box 8 at the bottom of the pool is indicated by the dashed line 24. A water-tight automatic control unit 23 is mounted on the chassis. The control unit is connected by wiring housed in a floating hose, which also houses the motor supply cables, to a programming module (not shown) at the side of the pool. The module enables the operator to select the desired program for the pool cleaner, which then executes the program without further commands from the operator.

**Claims**

1. Procedure for cleaning the bottom and sides of a water-filled pool by means of an automatic pool cleaner equipped with motor-driven track belts and

with a programming module which can be operated from the side of the pool, **characterised in that** the pool cleaner is designed to traverse the bottom and sides of the pool in accordance with a predetermined pattern and, in so doing, to clean the surfaces by means of counter-rotating brush rollers (14), and, by means of a pump (4) and a filter (3), to clean the water of dirt removed by cleaning and return the clean water to the pool.

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2. Device for implementing the procedure as per patent claim 1, **characterised in that** the chassis (1) of the pool cleaner is equipped with two full-length counter-rotating brush rollers (14) mounted on swinging arms (13), and located so as to represent, respectively, the outermost extremities of the front and rear of the pool cleaner relative to its direction of travel through the pool in the course of the cleaning process. Each of the brush rollers is equipped with a longitudinal shield (17) extending about one-quarter way around the brush and attached to the swinging arms (13). The shield is sealed against the pool cleaner chassis by means of a skirt (18) made of an elastic material and extending along the shield.

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3. Device as per patent claim 2, **characterised in that** each of the brush rollers (14) is driven by belt from its own drive motor (21), which is connected electrically to an automatic control unit (23) mounted on the chassis and which senses the increase in current in the drive motor (21) which occurs when the brush roller driven by the motor encounters an obstacle, such as a pool wall, and reverses the pool cleaner drive motors (19) so that the unit travels away from the obstacle.

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4. Device as per patent claim 1, **characterised in that** each of the brush rollers (14) is driven by belt from its own drive motor (21), which is connected electrically to an automatic control unit (23) mounted on the chassis and which, after a certain variable time, resets the pool cleaner drive motors (19) for travel in the reverse direction but which, if the current in the brush roller drive motor (21) increases within that time due to the pool cleaner encountering an obstacle, such as a pool wall, reverses the cleaner motors (19) so that the unit travels away from the obstacle.

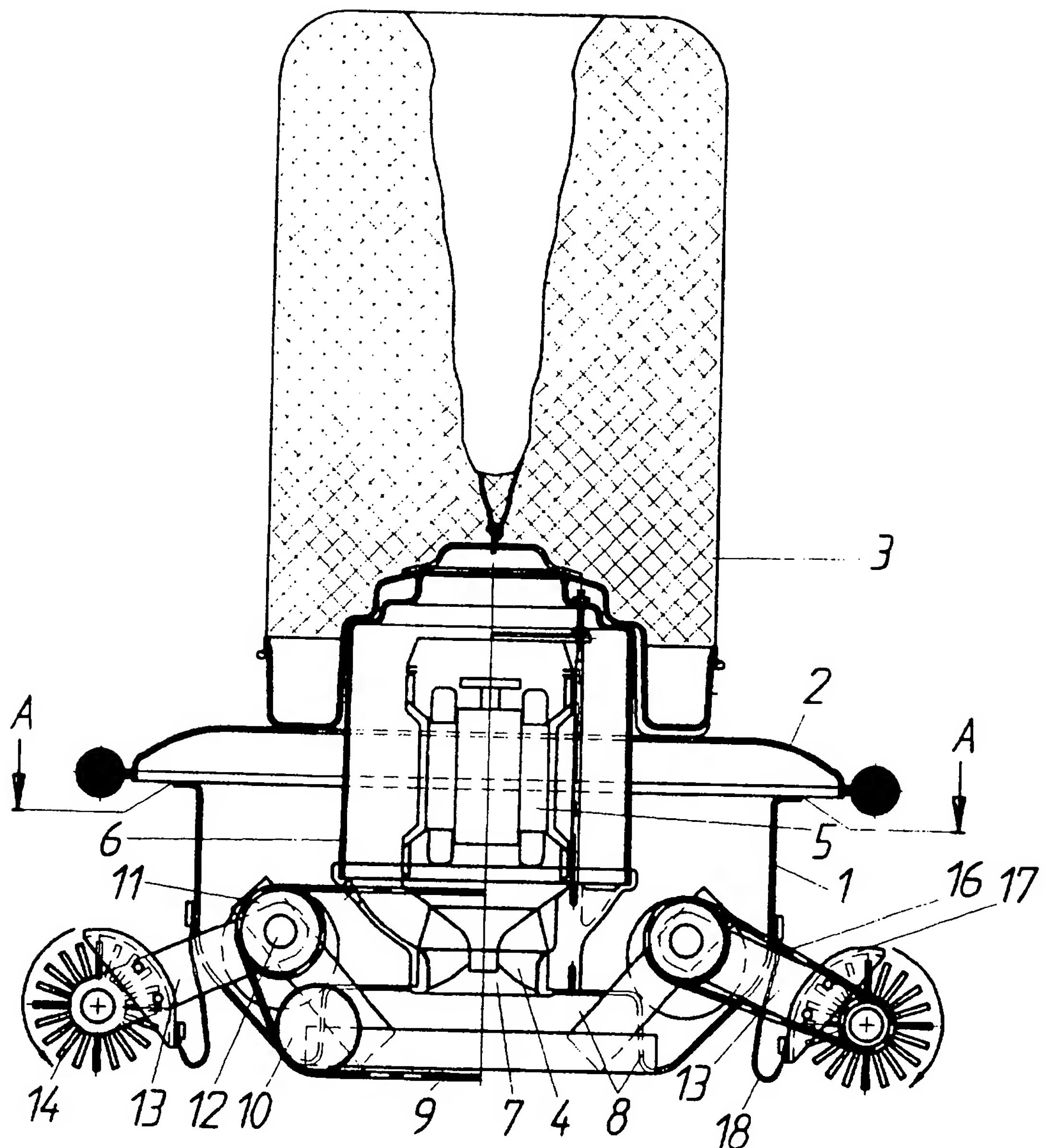
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5. Device as per patent claims 3 and 4, **characterised in that** the automatic control unit (23) is connected by wiring housed in a floating hose to a programming module at the side of the pool, enabling the operator to select the desired pool cleaner program, which is then executed by the control unit.

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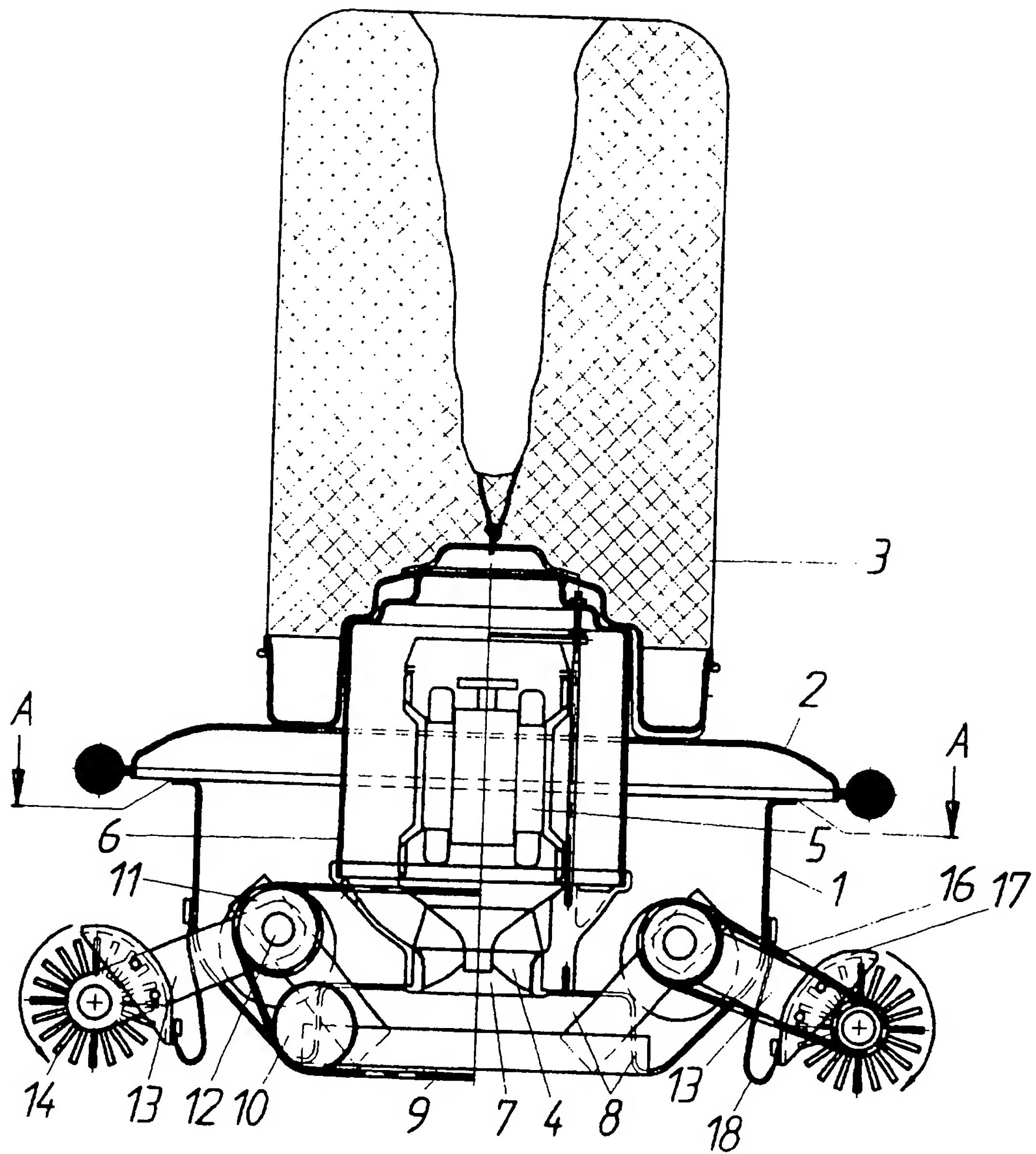


FIGUR 1

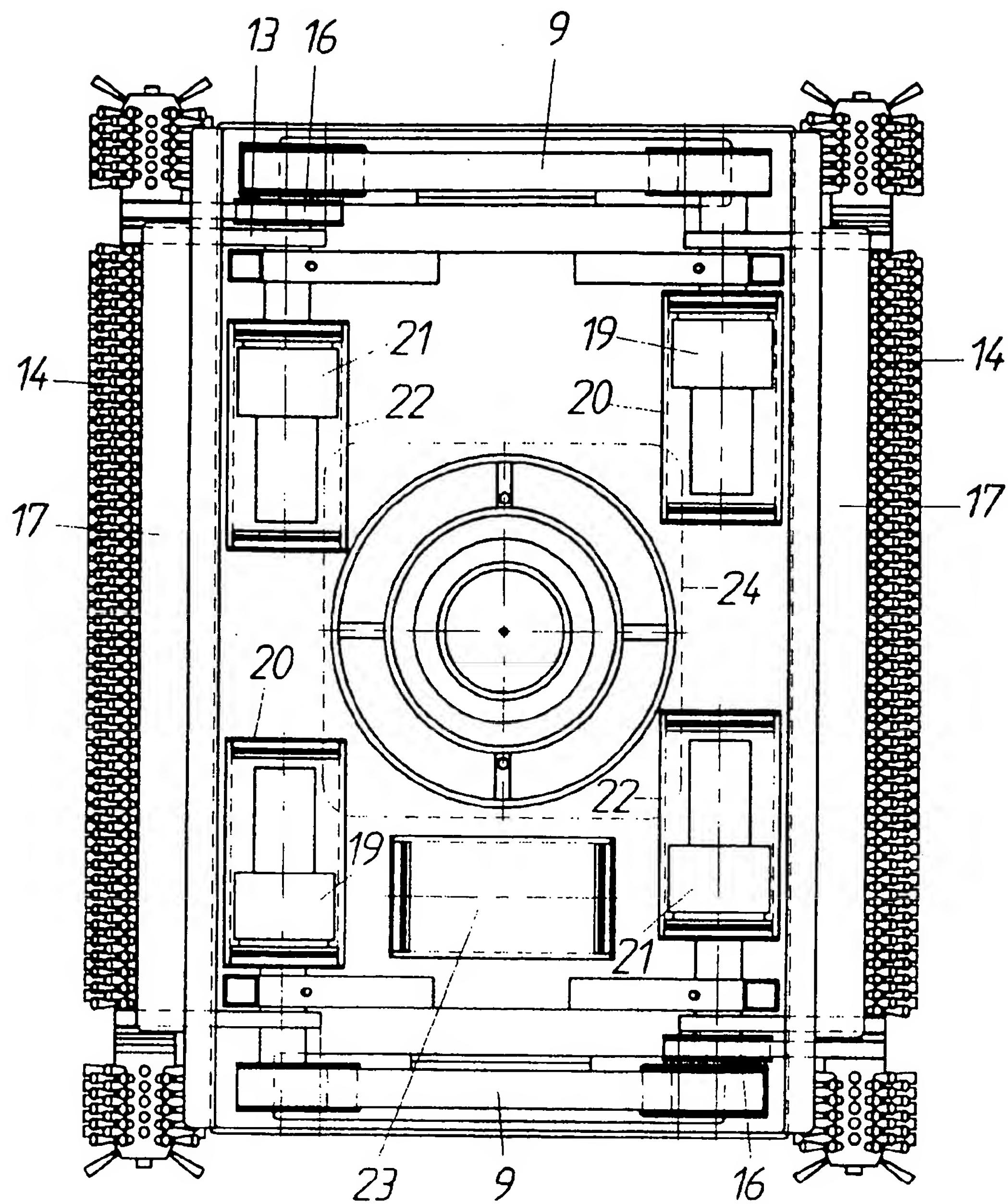
with a programming module which can be operated from the side of the pool, **characterised in that** the pool cleaner is designed to traverse the bottom and sides of the pool in accordance with a predetermined pattern and, in so doing, to clean the surfaces by means of counter-rotating brush rollers (14), and, by means of a pump (4) and a filter (3), to clean the water of dirt removed by cleaning and return the clean water to the pool.

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2. Device for implementing the procedure as per patent claim 1, **characterised in that** the chassis (1) of the pool cleaner is equipped with two full-length counter-rotating brush rollers (14) mounted on swinging arms (13), and located so as to represent, respectively, the outermost extremities of the front and rear of the pool cleaner relative to its direction of travel through the pool in the course of the cleaning process. Each of the brush rollers is equipped with a longitudinal shield (17) extending about one-quarter way around the brush and attached to the swinging arms (13). The shield is sealed against the pool cleaner chassis by means of a skirt (18) made of an elastic material and extending along the shield. 10  
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3. Device as per patent claim 2, **characterised in that** each of the brush rollers (14) is driven by belt from its own drive motor (21), which is connected electrically to an automatic control unit (23) mounted on the chassis and which senses the increase in current in the drive motor (21) which occurs when the brush roller driven by the motor encounters an obstacle, such as a pool wall, and reverses the pool cleaner drive motors (19) so that the unit travels away from the obstacle. 20  
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4. Device as per patent claim 1, **characterised in that** each of the brush rollers (14) is driven by belt from its own drive motor (21), which is connected electrically to an automatic control unit (23) mounted on the chassis and which, after a certain variable time, resets the pool cleaner drive motors (19) for travel in the reverse direction but which, if the current in the brush roller drive motor (21) increases within that time due to the pool cleaner encountering an obstacle, such as a pool wall, reverses the cleaner motors (19) so that the unit travels away from the obstacle. 40  
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5. Device as per patent claims 3 and 4, **characterised in that** the automatic control unit (23) is connected by wiring housed in a floating hose to a programming module at the side of the pool, enabling the operator to select the desired pool cleaner program, which is then executed by the control unit. 55



FIGUR 1



FIGUR 2

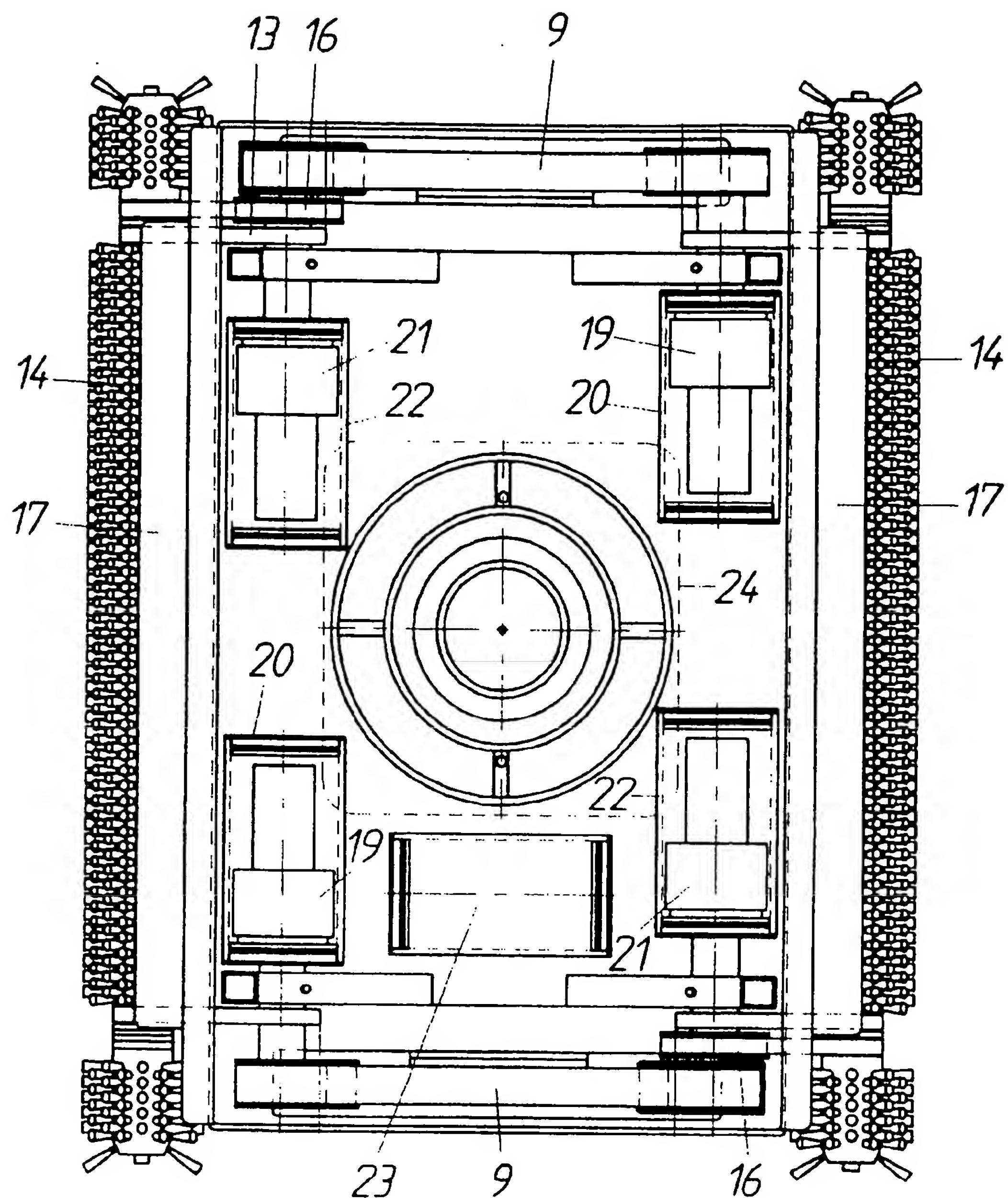


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## EUROPEAN SEARCH REPORT

Application Number  
EP 98 85 0141.7

DOCUMENTS CONSIDERED TO BE RELEVANT									
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.6)						
A	SE 436777 B (SOMMER SCHENK AG), 21 January 1985 (21.01.85)  --	1-5	E04H 4/16						
A	SE 465629 B (M. NYSTRÖM), 7 October 1991 (07.10.91)  --	1-5							
A	US 2988762 A (H.H. BABCOCK), 20 June 1961 (20.06.61)  -- --	1-5							
A	US 5337434 A (G. ERLICH), 16 August 1994 (16.08.94)  -----	1-5							
TECHNICAL FIELDS SEARCHED (Int. Cl.6)									
E04H									
<p>The present search report has been drawn up for all claims</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>STOCKHOLM</td> <td>7 December 1998</td> <td>OLOFSSON ÅKE</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	STOCKHOLM	7 December 1998	OLOFSSON ÅKE
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CATEGORY OF CITED DOCUMENTS									
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FIGUR 2



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Place of search	Date of completion of the search	Examiner	
STOCKHOLM	7 December 1998	OLOFSSON ÅKE	
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SE 465629 B	07/10/91	EP 0257006 A,B SE 8603505 A US 4786334 A	24/02/88 21/02/88 22/11/88
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